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Remarks

This Amendment is responsive to the November 16, 2006 Office Action. Reexamination and reconsideration of claims 1-18, 21-59, and 63 is respectfully requested.

Summary of The Office Action

Claims 1-18, 21-59, and 63 were rejected under 35 U.S.C. §103(a) as being unpatentable over Gerchman et al. (US Pat. No. 6,292,869) (Gerchman). Gerchman describes self timed refresh (STR) of DRAMs, and an interaction between scrubbing and STR. Gerchman does not describe a mirror location that can handle storage requests for a location being scrubbed, storing main memory contents in that mirror location, and directing reads/writes to that mirror location while the original location is scrubbed. Instead, Gerchman describes how a storage request (e.g., read, write) will terminate both STR and scrubbing. The storage request terminates both STR and scrubbing because the STR and scrubbing are done in place, without mirroring the location out to a second location to which the read and/or write could be redirected.

The Claims Patentably Distinguish Over the References of Record**35 U.S.C. §103**

To establish a prima facie case of 35 U.S.C. §103 obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. MPEP 2143.01 Second, there must be a reasonable expectation of success. MPEP 2143.02 Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. MPEP 2143.03 Additionally, the teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in applicant's disclosure. In re Vaack, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). This requirement is intended to prevent unacceptable "hindsight reconstruction" where Applicant's invention is recreated from references using the Application as a blueprint.

Here, none of the first, second, or third criteria described in MPEP 2143 are satisfied since (1) there is no suggestion or motivation to modify the reference, (2) there is no reasonable expectation of success, and (3) the reference does not teach or suggest all the claim limitations.

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None of the references, alone and/or in combination, teach mirroring a first memory location into a second memory location, redirecting memory accesses directed at the first memory location to the second location, and scrubbing the first memory location. Additionally, there is no suggestion, teaching, or motivation to modify the reference to add a mirror location since the reference halts both self timed refreshing and scrubbing upon receiving a storage request (e.g., read, write). Thus, none of the claims are obvious for at least this reason.

Gerchman

Gerchman describes self timed refreshing (STR) of DRAMs. Gerchman also describes an interaction between scrubbing and STR. DRAMs "need to have the charge in their array cells periodically refreshed to retain the data contents." Col. 1, lines 23-25. This refreshing is normally initiated externally. Gerchman describes a method for self-refreshing a DRAM without relying on external refresh initiation. This refreshing has nothing to do with the mirroring and scrubbing claimed and described in the application.

Gerchman does not describe a mirror location that can handle storage requests for a location being scrubbed. Instead, Gerchman describes how a storage request (e.g., read, write) will terminate both STR and scrubbing. "Upon detecting storage activity, while storage is in STR mode, STR mode is terminated." Col. 1, lines 64-65. "If a memory read or write request 120/122 does occur during the scrub operation (line 152 is active), scrub control 130 turns off (line 158 goes active) flag 132." Col. 4, lines 3-6. The storage request terminates both STR and scrubbing because the STR and scrubbing are done in place, without mirroring the location out to a second location to which the read and/or write could be redirected.

The hardware in Gerchman simply does not include the extra memory into which the contents of memory to be scrubbed is mirrored and for this reason all the claims are not obvious and are in condition for allowance.

The Office Action (page 4) asserts "that there must be some selectively mirrored memory element used in order to read to and write from during the scrubbing process." This assertion is both irrelevant and incorrect. It is irrelevant, because the claims concern handling reads and requests that occur while a location is mirrored, not temporary storage used in scrubbing. It is incorrect because reads and/or writes that occur during either scrubbing and/or STR terminate the scrubbing and/or STR. They terminate the scrubbing and/or STR because the scrubbing is

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done in place, without moving the contents of the main memory location to a second location to which the reads and writes can be directed.

Consider, for example, claim 1, in which the scrub logic mirrors a main memory location into the memory in the memory access logic. Then, when storage activity (e.g., read, write) occurs for that mirrored location, the storage activity can be directed to the mirroring location, leaving the scrub logic free to continue scrubbing the mirrored main memory location.

In Gerchman, when storage activity occurs, STR terminates. "Upon detecting a read or write operation, controller 62 signals storage 66 to exit STR mode." Col. 2, lines 30-32. Also, when storage activity occurs, scrubbing is halted. "If a memory read or write request 120/122 does occur during the scrub operation (line 152 is active), scrub control 130 turns off (line 158 goes active) flag 132." Col. 4, lines 3-6. The activities are terminated simply because there is no additional memory location like that claimed into which main memory contents are copied and to which read/write requests are directed while the main memory location is being scrubbed.

Individual claims are discussed below.

Independent Claim 1

Claim 1 recites a memory access logic that includes a memory (e.g., mirroring location) that can store values from mirrored locations and that can accept memory access requests that were initially directed at the mirrored location but which instead are redirected to the mirroring location. The memory access logic also includes a scrub logic that will cause main memory to be mirrored to the mirroring location and that will selectively scrub the mirrored locations. Gerchman does not teach these elements and thus this claim is not obvious. In particular, Gerchman does not teach the mirroring action performed by the scrub logic. Thus, when any storage request occurs (e.g., read, write), both the STR and the scrubbing described in Gerchman are terminated. They are terminated because the STR and scrubbing are done in place, without first mirroring out the contents of the memory location being refreshed and/or scrubbed.

The Office Action asserts that it is obvious that "there must be some selectively mirrored memory element used in order to read to and write from during the scrubbing process." This unsupported assertion does not withstand scrutiny on two fronts. First, it appears to concern a memory location being used by a scrubbing process. This is irrelevant to the claimed mirror

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location being populated by the scrubbing logic that can handle reads and writes while the mirrored location is scrubbed. Second, it ignores the fact that the reference does not handle reads and/or writes while scrubbing is in progress. Instead the reference halts scrubbing and handles the read or write. This occurs because the scrubbing is being done in place. The reference mentions neither a memory (e.g., mirroring location) nor a scrub logic that mirrors a main memory location. For at least this reason this claim is not obvious and is in condition for allowance.

Independent Claims 1, 34, 52, 56, 57, and 63

The Office Action rejects all these independent claims in one omnibus rejection using the same unsupported assertion, that "there must be some selectively mirrored memory element used in order to read to and write from during the scrubbing process." Even if this assertion were true, which it is not, the Office Action fails to address the additional limitations in independent claim 34 (fault management logic), independent claim 52 (selectively copying contents of a main memory location to a cache memory location, logically replacing main memory location with cache memory location), independent claim 56 (selectively copying contents of a main memory location to a cache memory location, logically replacing main memory location with cache memory location, selectively processing a memory fault), independent claim 57 (scrubbing without disturbing the operation of components configured to access the memory location), and independent claim 63 (logically replacing a memory location with a cache memory location, means for managing memory faults).

Thus the Office Action is incomplete with respect to each of these additional independent claims and no final office action can issue until a complete examination has occurred. If the Office Action had addressed these additional elements, it would have discovered that Gerchman is silent concerning any of these elements, leaving these claims not obvious and thus in condition for allowance.

Dependent Claims 2-18, 21-33

These claims depend, directly and/or indirectly, from claim 1. Claim 1 has been shown to be not obvious. Thus these claims are similarly not obvious. Individual arguments are provided below.

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Claim 2

This claim depends from claim 1, which has been shown to be not obvious. Thus, this claim is similarly not obvious. Additionally, this claim recites that the memory access logic comprises an ASIC. The Office Action asserts that "the placement of a device in an ASIC, computer, or an image forming device would have been an obvious design choice." In the omnibus rejection of claims 2, 16, 17, 33, 35, 50, and 51, the Office Action appears to be confusing devices into which the claimed system could be incorporated (e.g., computer, printer) and an embodiment of the system (e.g., ASIC). Nothing in Gerchman indicates that its irrelevant processing (e.g., non-mirroring in-place scrubbing) could be embodied in an ASIC. For this additional reason this claim is not obvious and is in condition for allowance.

Claim 3

This claim depends from claim 1, which has been shown to be not obvious. Thus, this claim is similarly not obvious. Additionally, this claim recites that the memory access logic comprises a PROM. The Office Action relies on Col. 2, line 23-26 to support its assertion that Gerchman teaches a memory access logic being an SDRAM. This is incorrect. The passage recites that the system in Gerchman performs STR and/or scrubbing of SDRAMs. Scrubbing an SDRAM in no way teaches building into a PROM a memory access logic that mirrors and scrubs memory. The Office Action asserts that "a SDRAM is the functional equivalent to PROM and therefore an obvious design choice". Nothing in Gerchman indicates that its processing, which does not include mirroring and scrubbing the mirrored location, could be embodied in a PROM. Indeed, insisting that Gerchman could be implemented in a PROM is inconsistent with the assertion that Gerchman must include a re-writeable location to mirror while scrubbing. Such a re-writeable location could not exist in a PROM. For this additional reason this claim is not obvious and is in condition for allowance.

Claim 4

Claim 4 depends from claim 1. Claim 1 has been shown to be not obvious. Thus, this claim is similarly not obvious. Additionally, claim 4 recites that the system includes a second memory that stores configuration parameters. The Office Action asserts that Gerchman teaches

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"previous STR and Scrub remembers that SDRAMs were previously in the STR mode..." While Gerchman may indeed teach a system that remembers what mode it was in, this is irrelevant to claim 4, which concerns an additional memory for storing configuration parameters. While Gerchman may track STR state, this is irrelevant to including an additional memory to store configuration parameters associated with scrubbing. Since Gerchman does not teach the claimed memory, mirroring, and scrubbing, it follows that Gerchman also does not provide the further limitation of a memory to store configuration parameters to control the scrubbing after mirroring. For this additional reason this claim is not obvious and is in condition for allowance.

Claim 5

This claim depends from claim 4, which has been shown to be not obvious, and thus this claim is similarly not obvious. Additionally, this claim recites that the second memory comprises one or more registers. Since the reference does not even mention the second memory, it follows that it does not further characterize the missing element. For this additional reason this claim is not obvious and is in condition for allowance.

Claim 6

Claim 6 depends from claim 4. Claim 4 has been shown to be not obvious. Thus, this claim is similarly not obvious. Additionally, claim 6 recites that the second memory is writeable by an application located external to the memory access logic. The Office Action asserts that it is well known that an internal memory element can be readable and writeable by an external application. While this may be true, it is irrelevant to claim 6, and the other claims (11, 14, 23, 28, 30, 39, 44, 46, and 47) that are likewise rejected in an omnibus rejection.

Since Gerchman does not teach the claimed second memory, it follows that Gerchman also does not provide the further limitation of an external logic being able to write the second memory. Allowing an external application to write the second memory, which may store configuration parameters, facilitates making memory scrubbing configuration available at higher application levels (e.g., user level) than is conventionally found. For this additional reason this claim is not obvious and is in condition for allowance.

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Claim 7

Claim 7 depends from claim 4. Claim 4 has been shown to be not obvious. Thus, this claim is similarly not obvious. Additionally, claim 7 recites that the second memory stores an on/off parameter, addresses, rates, log configuration parameters, and so on. The Office Action asserts that Gerchman teaches "previous STR and Scrub remembers that SDRAMs were previously in the STR mode..." While Gerchman may teach a system that tracks state, this is irrelevant to claim 7, which further characterizes what is stored in the additional memory for storing configuration parameters. Since Gerchman does not teach the claimed second memory, it follows that Gerchman also does not describe the type of parameters stored in the second memory. For this additional reason this claim is not obvious and is in condition for allowance.

Claim 8

Claim 8 depends from claim 7. Claim 7 has been shown to be not obvious. Thus, this claim is similarly not obvious. Additionally, claim 8 recites that a log configuration parameter may store an entry point address for a logging process. The Office Action asserts that Gerchman teaches "previous STR and Scrub remembers that SDRAMs were previously in the STR mode..." While Gerchman may teach a system that remembers what mode it was in, this is irrelevant to this claim, which concerns a further limitation on a log configuration parameter. In particular, the log configuration parameter stores an entry point address for a logging process. Gerchman does not teach logging, and thus it follows that it does not teach the additional limitation of storing entry point addresses for logging processes. For this additional reason this claim is not obvious and is in condition for allowance.

Claim 9

This claim depends from claim 1, which has been shown to be not obvious, and thus this claim is similarly not obvious. Additionally, this claim recites that the system includes a log configured to store a result value associated with scrubbing the main memory location. The Office Action asserts that "Gerchman ... teach memory controller places SDRAM memory into STR mode after an interval of inactivity to save power, and also periodically scrubs memory..." This has nothing to do with storing a result associated with scrubbing memory and thus cannot possibly have anything to do with selectively producing the result value. The Office Action also

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asserts that "the purpose of the scrubbing performed is to detect and correct errors (col. 3, 42-46, col. 2, lines 33-40). Once again, this is irrelevant to the claimed element, leaving the reference deficient in that it does not teach each and every element claimed. For this additional reason this claim is not obvious and is in condition for allowance.

Claim 10

This claim depends from claim 9, which has been shown to be not obvious, and thus this claim is similarly not obvious. Additionally, this claim recites that the log comprises one or more registers. Since the reference does not even mention the log, it follows that it does not further characterize the missing element. For this additional reason this claim is not obvious and is in condition for allowance.

Claim 11

Claim 11 depends from claim 9. Claim 9 has been shown to be not obvious. Thus, this claim is similarly not obvious. Additionally, claim 11 recites that the system includes a log that can be read by an application located external to the memory access logic. The Office Action asserts that it is well known for an internal memory element to be readable and writeable by an external application. This is irrelevant to a claim that describes how a log is readable by an application external to the memory access logic since, like all the other rejections concerning the log, the reference simply does not describe logging the result of a scrub operation. Since the reference is silent about logging, it follows that it does not describe making the log readable outside the memory access logic. For this additional reason this claim is not obvious and is in condition for allowance.

Claim 12

Claim 12 depends from claim 1. Claim 1 has been shown to be not obvious. Thus, this claim is similarly not obvious. Additionally, claim 12 recites that the scrub logic can selectively generate a signal when a main memory location being scrubbed exhibits a memory error. The reference is silent concerning detecting a memory error, let alone generating a signal when one is detected. For this additional reason this claim is not obvious and is in condition for allowance.

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Claim 14

Claim 14 depends from claim 1. Claim 1 has been shown to be not obvious. Thus, this claim is similarly not obvious. Additionally, claim 14 recites that the scrub logic can be written by an application located external to the memory access logic. The Office Action asserts that it is well known that an internal memory element can be readable and writeable by an external application. While true, this is irrelevant to a claim that makes a scrub logic writeable by an application external to the memory access logic. The scrub logic is claimed and described as being configured to selectively mirror a main memory location into a memory and to selectively scrub the main memory location. The Office Action has based a rejection of being able to write to a logic on being able to write to an internal memory location. This overlooks the distinction between a logic and a memory. For this additional reason this claim is not obvious and is in condition for allowance.

Claim 15

Claim 15 depends from claim 1. Claim 1 has been shown to be not obvious. Thus, this claim is similarly not obvious. Additionally, claim 15 recites that the scrub logic scrubs main memory transparently to operating system control. Gerchman says nothing about the transparency of a scrub logic to an operating system. In Gerchman, it is possible that a read associated with an operating system might be impacted by the STR and/or scrubbing.

The Office Action asserts that upon completing execution of a scrub request, storage is returned to STR mode. While true, this does not necessarily make the operation transparent to an operating system. For example, while the memory is in either STR mode or scrub mode, storage requests will be delayed, at least as long as it takes to terminate STR mode and scrub mode and to return flags to their non-STR mode and non-scrub mode states. Introducing this delay makes the processing no longer transparent. For this additional reason this claim is not obvious and is in condition for allowance.

Claim 18

Claim 18 depends from claim 1. Claim 1 has been shown to be not obvious. Thus, this claim is similarly not obvious. Additionally, claim 18 recites that the system includes a fault management logic to process a memory fault associated with a main memory location that has

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been mirrored and that is being scrubbed. The Office Action asserts that "Gerchman ... teach memory controller places SDRAM memory into STR mode after an interval of inactivity to save power, and also periodically scrubs memory..." This has nothing to do with fault management processing and thus does not disclose the claimed element. The Office Action also asserts that "the purpose of the scrubbing performed is to detect and correct errors (col. 3, 42-46, col. 2, lines 33-40). Once again, this is irrelevant to the claimed element, leaving the reference deficient in that it does not teach each and every element claimed. For this additional reason this claim is not obvious and is in condition for allowance.

Claim 21

Claim 21 depends from claim 18. Claim 18 has been shown to be not obvious. Thus, this claim is similarly not obvious. Additionally, claim 21 recites that a second memory stores configuration parameters associated with fault management processing. The Office Action asserts that "Gerchman teaches STR and Scrub that can remember that SDRAMs were in an STR mode". This is unrelated to storing configuration parameters associated with fault management processing and thus does not disclose this element. Gerchman does not indicate that a second memory has been added to the access logic to store configuration parameters for fault management processing. Since Gerchman does not teach the claimed memory access logic and post-mirroring detecting, correcting, and/or fault management processing, it follows that Gerchman also does not provide the further limitation of a memory to store configuration parameters that control the post-mirroring actions. For this additional reason this claim is not obvious and is in condition for allowance.

Claim 22

Claim 22 depends from claim 21. Claim 21 has been shown to be not obvious. Thus, this claim is similarly not obvious. Additionally, claim 22 recites that the second memory may be a register(s). The Office Action asserts that memory is the functional equivalent of a register. However, Gerchman says nothing about a second memory in a memory access logic, let alone further describing how the missing second memory is made from registers. Since Gerchman does not teach the claimed memory access logic and its second memory, it follows that

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Gerchman also does not provide the further limitation of the memory being implemented in registers. For this additional reason this claim is not obvious and is in condition for allowance.

Claim 23

Claim 23 depends from claim 21. Claim 21 has been shown to be not obvious. Thus, this claim is similarly not obvious. Additionally, claim 23 recites that the second memory may be writeable by an external application. The Office Action asserts that it is well known that an internal memory element can be readable and writeable by an external application. While this may be true, it is irrelevant to this claim, which makes scrubbing configuration and fault management configuration available to higher level applications. Thus the asserted item does not disclose the claimed element.

Since Gerchman does not teach the claimed second memory, it follows that Gerchman also does not provide the further limitation of an external logic being able to write the second memory. Allowing an external application to write the second memory, which may store configuration parameters, makes fault management configuration available at higher application levels (e.g., user level) than is conventionally found. For this additional reason this claim is not obvious and is in condition for allowance.

Claim 24

Claim 24 depends from claim 21. Claim 21 has been shown to be not obvious. Thus, this claim is similarly not obvious. Additionally, claim 24 recites that the second memory stores an on/off parameter, addresses, rates, log configuration parameters, and so on. The Office Action asserts that Gerchman retains state for STR and Scrub. Even if Gerchman maintains such state, it is irrelevant to these additional characterizations of fault management processing configuration parameters and thus does not disclose the claimed element. For this additional reason this claim is not obvious and is in condition for allowance.

Claim 25

Claim 25 depends from claim 24. Claim 24 has been shown to be not obvious. Thus, this claim is similarly not obvious. Additionally, claim 25 recites that a log configuration parameter may store an entry point address for a fault management process. The Office Action

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asserts that "Gerchman ... teach memory controller places SDRAM memory into STR mode after an interval of inactivity to save power, and also periodically scrubs memory..." This has nothing to do with a log configuration parameter or what it stores. The Office Action also asserts that "the purpose of the scrubbing performed is to detect and correct errors (col. 3, 42-46, col. 2, lines 33-40). Once again, this is irrelevant to the claimed element, leaving the reference deficient in that it does not teach each and every element claimed. Applicant respectfully requests a citation to the portion of Gerchman that teaches storing the entry point address for the fault management process. Since none can be found, then for this additional reason this claim is not obvious and is in condition for allowance.

Gerchman mentions neither a log configuration parameter nor a fault management process. Thus, it follows that it also does not mention storing an entry point address for a fault management process in the missing configuration parameters. For this additional reason this claim is not obvious and is in condition for allowance.

Claim 26

Claim 26 depends from claim 18. Claim 18 has been shown to be not obvious. Thus, this claim is similarly not obvious. Additionally, claim 26 recites that the system includes a log configured to store a result value associated with fault management processing of a memory fault experienced by the main memory location during post mirroring fault management processing. The Office Action simply asserts that Gerchman maintains state, which does not disclose the claimed element.

However, in Gerchman there is no mention of a log that stores the result of memory fault processing. Thus Gerchman does not teach each and every limitation of this claim and for this additional reason this claim is not obvious and is in condition for allowance.

Claim 27

This claim depends from claim 26, which has been shown to be not obvious, and thus this claim is similarly not obvious. Additionally, this claim recites that the log comprises one or more registers. Since the reference does not even mention the log, it follows that it does not further characterize the missing element as being made from registers, leaving the claimed

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element undisclosed. For this additional reason this claim is not obvious and is in condition for allowance.

Claim 28

Claim 28 depends from claim 26. Claim 26 has been shown to be not obvious. Thus, this claim is similarly not obvious. Additionally, claim 28 recites that the log that can be read by an application located external to the memory access logic. Like all the other rejections concerning the log, the reference simply does not describe logging the result of an operation, let alone having that log be readable by an application outside the memory access logic. For this additional reason this claim is not obvious and is in condition for allowance.

Claim 29

Claim 29 depends from claim 18. Claim 18 has been shown to be not obvious. Thus, this claim is similarly not obvious. Additionally, claim 29 recites that the fault management logic can selectively generate a signal when a main memory location exhibits a memory fault. The Office Action asserts that "Gerchman ... teach memory controller places SDRAM memory into STR mode after an interval of inactivity to save power, and also periodically scrubs memory..." This has nothing to do with generating a signal when the main memory location exhibits a memory fault, leaving the claimed element undisclosed. The Office Action also asserts that "the purpose of the scrubbing performed is to detect and correct errors (col. 3, 42-46, col. 2, lines 33-40). This is irrelevant to the claimed element (generating a signal when a fault is detected), leaving the reference deficient in that it does not teach each and every element claimed. For this additional reason this claim is not obvious and is in condition for allowance.

Claim 30

Claim 30 depends from claim 18. Claim 18 has been shown to be not obvious. Thus, this claim is similarly not obvious. Additionally, claim 30 recites that the fault management logic can be written by an application located external to the memory access logic. The Office Action asserts that it is well known that an internal memory element can be readable and writeable by an external application. While true, this is irrelevant to a claim that makes a fault management logic writeable by an application external to the memory access logic. The fault

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management logic is claimed and described as being configured to selectively process a memory fault associated with a main memory location. The Office Action has based a rejection of being able to write to a logic on being able to write to an internal memory location. This overlooks the distinctions between a logic and a memory, leaving the claimed element undisclosed. For this additional reason this claim is not obvious and is in condition for allowance.

There is no fault management logic described in Gerchman, and thus it follows that there is also no description of how it can be written by an external application. For this additional reason this claim is not obvious and is in condition for allowance.

Claim 31

Claim 31 depends from claim 18. Claim 18 has been shown to be not obvious. Thus, this claim is similarly not obvious. Additionally, claim 31 recites that the fault management logic performs fault management transparently to operating system control. In Gerchman, it is possible that a read associated with an operating system might be impacted by the described STR and/or scrubbing. The claimed invention would not suffer the same impact, because the memory location being read would have been mirrored.

The Office Action asserts that upon completing execution of a scrub request, storage is returned to STR mode. While true, this does not necessarily make the operation transparent to an operating system. For example, while the memory is in either STR mode or scrub mode, storage requests will be delayed, at least as long as it takes to terminate STR mode and scrub mode and to return flags to their non-STR mode and non-scrub mode states. Introducing this delay makes the processing no longer transparent. For this additional reason this claim is not obvious and is in condition for allowance.

Claim 32

Claim 32 depends from claim 31. Claim 31 has been shown to be not obvious. Thus this claim is similarly not obvious. Additionally, this claim recites actions that the fault management logic may take, including logging data, correcting a fault, logically removing a location from main memory, and halting a computer. Since the reference does not teach a fault management logic, it follows that none of the actions described in this claim are taught by the reference. The

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Applicant invites a citation to a location in the reference where the fault management logic and/or the actions performed by the fault management logic as claimed are described.

Independent Claim 34

Claim 34 describes a main memory controller that can be connected to both a main memory and a processor. The claimed main memory controller includes a memory that can logically replace one or more main memory locations. The claimed main memory controller also includes a scrub logic and a fault management logic. The scrub logic can scrub main memory locations and the fault management logic can process memory faults generated by the main memory locations. Both the scrub logic and fault management logic are claimed as being part of the main memory controller.

The Office Action asserts that Gerchman simply must teach "some selectively mirrored memory element used in order to read and write from during the scrubbing process." This assertion is both incorrect and irrelevant. It is irrelevant because the assertion addresses how the scrubbing described in Gerchman must use some temporary location when doing the scrubbing. While it may indeed use a temporary location while scrubbing that location, that is not what is claimed, and thus the assertion is irrelevant. The assertion is incorrect because Gerchman halts both STR and scrubbing when either a read or write involving a location being scrubbed occurs. Being both incorrect and irrelevant, the assertion leaves the claimed element undisclosed. For at least this reason this claim is not obvious and is in condition for allowance.

Claim 35

This claim depends from claim 34, which has been shown to be not obvious. Thus, this claim is similarly not obvious. Additionally, this claim recites that the main memory controller comprises an ASIC. The Office Action asserts that "the placement of a device in an ASIC, computer, or an image forming device would have been an obvious design choice." The Office Action appears to be confusing devices into which the claimed system could be incorporated (e.g., computer, printer) with an embodiment of the system (e.g., ASIC). Nothing in Gerchman indicates that its irrelevant processing (e.g., non-mirroring in-place scrubbing) could be embodied in an ASIC, leaving the claimed element undisclosed. For this additional reason this claim is not obvious and is in condition for allowance.

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Claim 36

This claim depends from claim 34, which has been shown to be not obvious. Thus, this claim is similarly not obvious. Additionally, this claim recites that the main memory controller comprises a PROM. The Office Action relies on Col. 2, line 23-26 to support its assertion that Gerchman teaches a memory access logic being an SDRAM. This is incorrect. The passage recites that the system in Gerchman can do STR and/or scrubbing of SDRAMs. Scrubbing an SDRAM does not teach building a memory access logic that mirrors and scrubs into a PROM. The Office Action asserts that "a SDRAM is the functional equivalent to PROM and therefore an obvious design choice". Nothing in Gerchman indicates that its processing, which does not include mirroring and scrubbing the mirrored location, could be embodied in a PROM. For this additional reason this claim is not obvious and is in condition for allowance.

Claim 37

Claim 37 depends from claim 34. Claim 34 has been shown to be not obvious and thus this claim is similarly not obvious. Additionally, claim 37 recites that the main memory controller includes a second memory to store configuration parameters. These configuration parameters include parameters associated with controlling scrubbing and parameters associated with controlling fault management. Since Gerchman says nothing about fault management, it follows that Gerchman is silent concerning configuration parameters for the missing element. For this additional reason this claim is not obvious and is in condition for allowance.

Claim 38

This claim depends from claim 37, which has been shown to be not obvious, and thus this claim is similarly not obvious. Additionally, this claim recites that the second memory comprises one or more registers. Since the reference does not even mention the second memory, it follows that it does not further characterize the missing element. For this additional reason this claim is not obvious and is in condition for allowance.

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Claim 39

This claim depends from claim 37, which has been shown to be not obvious, and thus this claim is similarly not obvious. Additionally, this claim recites that the second memory is writeable by an application located external to the memory access logic. The Office Action asserts that it is well known that an internal memory element can be readable and writeable by an external application. While this may be true, it is irrelevant to this claim, which makes scrubbing and fault management configuration available to higher level applications. Thus the claimed element remains undisclosed.

Since Gerchman does not teach the claimed second memory, it follows that Gerchman also does not provide the further limitation of an external logic being able to write the second memory. Allowing an external application to write the second memory, which may store configuration parameters, facilitates making memory scrubbing configuration available at higher application levels (e.g., user level) than is conventionally found. For this additional reason this claim is not obvious and is in condition for allowance.

Claim 40

Claim 40 depends from 37, which has been shown to be not obvious. Thus, this claim is similarly not obvious. Additionally, claim 40 recites various values that the second memory may store. Since the reference does not even describe the second memory, it follows that it does not describe the additional limitations concerning the values that can be stored in the second memory. For this additional reason this claim is not obvious and is in condition for allowance.

Claim 41

This claim depends from claim 40, which has been shown to be not obvious, and thus this claim is similarly not obvious. Additionally, this claim recites that a log configuration parameter may store an entry point address for a fault management process. The Office Action asserts that Gerchman teaches the purpose of scrubbing is to detect and correct errors. While this may be true, it is irrelevant to this claim, which concerns a further limitation on a log configuration parameter. In particular, the log configuration parameter stores an entry point address for a logging process. Gerchman does not teach logging, and thus it follows that it does not teach the

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additional limitation of storing entry point addresses for logging processes. For this additional reason this claim is not obvious and is in condition for allowance.

Claim 42

Claim 42 depends from 34, which has been shown to be not obvious. Thus, this claim is similarly not obvious. Additionally, claim 42 recites that the system includes a log that stores a result value associated with scrubbing or processing a memory fault. Since the reference does not even describe the mirroring then scrubbing and/or memory fault management processing, it follows that it does not describe the additional limitations concerning the result values associated with these actions that can be stored. Even if Gerchman teaches scrubbing and fault processing, it does not describe storing a result associated with detection and processing. For this additional reason this claim is not obvious and is in condition for allowance.

Claim 43

This claim depends from claim 42, which has been shown to be not obvious, and thus this claim is similarly not obvious. Additionally, this claim recites that the log comprises one or more registers. Since the reference does not even mention the log, it follows that it does not further characterize the missing element. For this additional reason this claim is not obvious and is in condition for allowance.

Claim 44

Claim 44 depends from claim 42, which has been shown to be not obvious, and thus this claim is similarly not obvious. Additionally, claim 44 recites that the log can be read by an application located external to the memory access logic. The Office Action asserts that it is well known that an internal memory element can be readable and writeable by an external application. While true, this is irrelevant to a claim directed at a log that does not exist in the reference. There is, quite simply, no log described in Gerchman, and thus it follows that there is also no description of how it can be read by an external application. For this additional reason this claim is not obvious and is in condition for allowance.

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Claim 45

This claim was rejected using the same rationale as applied to claims 4, 7, 8, 21, 24, 26, 37, and 40. The same arguments therefore apply and thus this claim has been shown to be not obvious. Additionally, this claim depends from claim 34, which has been shown to be not obvious, and thus this claim is similarly not obvious.

Claim 46

This claim depends from claim 34, which has been shown to be not obvious, and thus this claim is similarly not obvious. Additionally, claim 46 recites that the scrub logic can be written by an application located external to the memory access logic. The Office Action asserts that it is well known that an internal memory element can be readable and writeable by an external application. While true, this is irrelevant to a claim that makes a scrub logic writeable by an application external to the memory access logic. The scrub logic is claimed and described as being configured to selectively mirror a main memory location into a memory and to selectively scrub the main memory location. The Office Action has based a rejection of being able to write to a logic on being able to write to an internal memory location. This overlooks distinctions between a logic and a memory, leaving the claimed element undisclosed. For this additional reason this claim is not obvious and is in condition for allowance.

Claim 47

This claim depends from claim 34, which has been shown to be not obvious, and thus this claim is similarly not obvious. Additionally, claim 46 recites that the fault management logic can be written by an application located external to the memory access logic. The Office Action asserts that it is well known that an internal memory element can be readable and writeable by an external application. While true, this is irrelevant to a claim that makes a fault management logic writeable by an application external to the memory access logic. The Office Action has based a rejection of being able to write to a logic on being able to write to an internal memory location. This overlooks distinctions between a logic and a memory, leaving the claimed element undisclosed. Additionally, the reference is silent concerning a fault management logic, and thus it follows that it is similarly silent about being able to write to the missing fault management logic. For this additional reason this claim is not obvious and is in condition for allowance.

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Claim 48

This claim depends from claim 34, which has been shown to be not obvious, and thus this claim is similarly not obvious. Additionally, this claim recites how scrubbing occurs transparently to operating system control of main memory. Gerchman adds flags that are monitored and maintained, and thus adds delays to read/write requests. These additional flags and delays do not leave the processing "transparent."

The Office Action asserts that upon completing execution of a scrub request, storage is returned to STR mode. While true, this does not necessarily make the operation transparent to an operating system. For example, while the memory is in either STR mode or scrub mode, storage requests will be delayed, at least as long as it takes to terminate STR mode and scrub mode and to return flags to their non-STR mode and non-scrub mode states. Introducing this delay makes the processing no longer transparent. For this additional reason this claim is not obvious and is in condition for allowance.

Claim 49

This claim depends from claim 34, which has been shown to be not obvious, and thus this claim is similarly not obvious. Additionally, this claim recites processing memory faults transparently to operating system control of main memory. Gerchman says nothing about the transparency of a fault management process to an operating system. In Gerchman, it is possible that a read associated with an operating system might be impacted by the STR and/or scrubbing. For this additional reason this claim is not obvious and is in condition for allowance.

Independent Claim 52

Claim 52 describes a method that includes copying contents to a cache memory location, logically replacing a main memory location with a cache memory location, and memory testing the main memory location (whose contents have been copied to the cache and for which reads/writes will be directed to the cache).

The Office Action asserts that Gerchman simply must teach "some selectively mirrored memory element used in order to read and write from during the scrubbing process." This assertion is both incorrect and irrelevant. It is irrelevant because the assertion addresses how the

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scrubbing described in Gerchman must use some temporary location when doing the scrubbing. While it may indeed use a temporary location while scrubbing that location, that is not what is claimed, and thus the assertion is irrelevant. The assertion is incorrect because Gerchman halts both STR and scrubbing when either a read or write involving a location being scrubbed occurs. Even if everything in the assertion were correct, which it is not, the claim would still not be obvious because Gerchman does not describe how the contents are copied to cache and then how the main memory location is logically replaced by the cache memory location. For at least this reason this claim is not obvious and is in condition for allowance.

Claim 53

This claim depends from claim 52. Claim 52 has been shown to be not obvious and thus this claim is similarly not obvious. Additionally, claim 53 recites selectively processing memory faults that occur during the testing. Since the reference does not teach the method that tests after mirroring, it follows that it also does not teach this additional action. The Office Action simply asserts that "the purpose of the scrubbing performed is to detect and correct errors." While this may be accurate with respect to "soft errors" in an SDRAM, it is irrelevant to the memory fault processing claimed and described, leaving this element undisclosed. For this additional reason the claim is not obvious and is in condition for allowance.

Claim 54

This claim depends from claim 53. Claim 53 has been shown to be not obvious and thus this claim is similarly not obvious. Additionally, claim 54 further limits the actions that fault management processing may include. Since the reference does not teach that the method performs fault management processing after mirroring, it follows that it also does not teach these additional limitations. For this additional reason the claim is not obvious and is in condition for allowance.

Claim 55

This claim depends from claim 52. Claim 52 has been shown to be not obvious and thus this claim is similarly not obvious. Additionally, claim 55 recites different approaches for scrubbing memory (e.g., a striping test). Since the reference does not teach the method that tests

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after mirroring, it follows that it also does not teach these additional limitations. For this additional reason the claim is not obvious and is in condition for allowance.

Independent Claim 56

Claim 56 claims a computer-readable medium that stores executable instructions for performing a method. The reference describes neither this computer-readable medium nor the method stored thereon. The method mirrors a first main memory location(s) to a second location(s), and then tests the first location(s). The reference does not do the mirroring first. For at least this reason this claim is not obvious and is in condition for allowance.

This claim describes a method that includes copying contents to a cache memory location, logically replacing a main memory location with a cache memory location, and memory testing the main memory location (whose contents have been copied to the cache and for which reads/writes will be directed to the cache). The claim also describes processing a memory fault when the memory testing produces a fault. The Office Action asserts that Gerchman simply must teach "some selectively mirrored memory element used in order to read and write from during the scrubbing process." As described above, this assertion is both incorrect and irrelevant. Even if everything in the assertion were correct, which it is not, the claim would still not be obvious because Gerchman does not describe how the contents are copied to cache and then how the main memory location is logically replaced by the cache memory location. Additionally, Gerchman does not describe processing a memory fault associated with memory testing the main memory location. For at least these reasons this claim is not obvious and is in condition for allowance.

Independent Claim 57

Claim 57 claims a memory access system that includes elements for mirroring, redirecting, and performing memory management operations on the mirrored location. The Office Action recites that Gerchman must teach a mirroring location. First, there is no need for Gerchman to teach a mirroring location because any read/write to a location being scrubbed halts the scrub. Second, Gerchman does not teach redirecting memory accesses, once again because any read/write to a location being scrubbed halts the scrub and proceeds normally. For at least these reasons this claim is not obvious and is in condition for allowance.

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Claim 58

This claim depends from claim 57, which has been shown to be not obvious. Additionally, this claim provide limitations on the memory management operations that are performed after mirroring and redirection. Since the reference describes neither mirroring nor redirection, it follows that it also does not describe these actions that can be performed after mirroring and redirection. For this additional reason this claim is not obvious and is in condition for allowance.

Claim 59

This claim depends from claim 57, which has been shown to be not obvious. Additionally, this claim provide limitations on the memory management operations that are performed after mirroring and redirection. Since the reference describes neither mirroring nor redirection, it follows that it also does not describe these actions that can be performed after mirroring and redirection. For this additional reason this claim is not obvious and is in condition for allowance.

Independent Claim 63

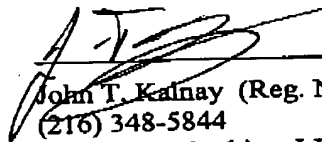
In view of the description of Gerchman, Applicant respectfully submits that Gerchman fails to anticipate each and every element of claim 63. In particular, Gerchman does not teach means for logically replacing a main memory location with a cache memory location, means for testing the main memory location, and means for managing memory faults. Therefore, claim 63 patentably distinguishes over Gerchman and should be allowed.

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Conclusion

For the reasons set forth above, claims 1-18, 21-59, and 63 patentably and unobviously distinguish over the references and are allowable. An early allowance of all claims is earnestly solicited.

Respectfully submitted,



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